

Earth's Hydrosphere

ES-5 The student will demonstrate an understanding of Earth's freshwater and ocean systems.

Key Concepts for ES-5:

Surface water: water cycle; lakes, rivers and drainage basins, wetlands

River systems: stages in river development – youthful, mature, old, rejuvenated

Groundwater: karst topography, chemical weathering, sinkholes and caverns

Seawater/Freshwater: physical properties, chemical properties

Shoreline interactions: waves, currents; shoreline features

Shoreline control: jetties, breakwaters, groins; sand dune vegetation anchoring

Transfer of energy: surface currents, deep currents; photosynthesis, chemosynthesis

Water pollution: point and nonpoint sources; groundwater pollution, ocean pollution

ES-5.1 Summarize the location, movement, and energy transfers involved in the movement of water on Earth's surface (including lakes, surface-water drainage basins [watersheds], freshwater wetlands, and groundwater zones).

Taxonomy level: 2.4-B Understand Conceptual Knowledge

Previous/future knowledge: Students in 6th grade summarized the dynamics of the water cycle including surface-water flow and groundwater flow. In 7th grade students studied the location and movement of water on Earth's surface in groundwater zones as well as surface-water drainage basins making them important to ecosystems and human activities. In Earth Science these concepts will be further studied as energy transfer is attributed to this continual movement of water on Earth.

It is essential for students to know that Earth's water supply is continually being recycled across Earth's surface in a process known as the *water cycle*. Energy from the Sun is the driving force for this cycle. The mechanics of the water cycle helps explain the variations in the amount of water available throughout the world. As water returns to Earth as precipitation, it may flow down slope along Earth's surface as runoff. Runoff may reach a stream, river, lake or wetlands area in its eventual surface flow toward the ocean.

Lakes Students should understand the conditions for a lake to form, how a lake is continually supplied with water, and movement of water within the lake.

Streams & Rivers Students should understand how stream systems form as water flows and collects in surface channels.

- Tributaries form as streams flow into each other.
- A large stream is called a *river*, and all tributaries make up a *river system*.
- They should know the factors that affect the speed of water flow and also what would cause rejuvenation of river flow.

Drainage Basin Students should be able to locate and trace the movement of water in a drainage basin, also called a *watershed*, by determining the land area that drains into a particular stream or river system. A *divide* is the high land area that separates one watershed from another.

Freshwater Wetlands A wetland area is land that is covered with water for a large part of the year. Students should know the various types of wetlands, the supply of water for wetlands, and the reasons for change in amount of water within a wetland area.

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Groundwater

Zones

Water that seeps into Earth's surface becomes *groundwater*.

- Vegetation, rate of precipitation, rock or soil composition are the conditions on the surface that would allow water to move downward into the ground (such as) as well as slope of the land area.
- Once water moves into the ground, zones of groundwater form. Students should understand the relationship of groundwater to the *zone of saturation, the water table, and the zone of aeration*.
- Students should also understand the formation of stored underground water in an *aquifer*.

It is not essential for students to know uses of surface water or groundwater as it moves through Earth's surface. They do not need to know the names for the surface water patterns or the reasons for changes in stream/river flow patterns.

Assessment Guidelines:

The objective of this indicator is to *summarize* information about water flow on and within Earth's surface; therefore, the primary focus of assessment should be to generalize major points about the location, the movement, and the energy that drives water to cycle on Earth's surface.

In addition to *summarize* appropriate assessments may require students to:

- *explain* how the Sun affects the location and movement of water on Earth's surface;
- *compare* the movement of water in a lake with that in a river or *compare* a lake to a wetlands area;
- *illustrate* by using maps the location of a drainage basin and divide; or
- *recall* groundwater zones.